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**System Sensor Smoke Detector  
Inspection and Testing Guidance**

*Testing and inspection requirements for smoke detectors are prescribed by the National Fire Protection Association (NFPA) in the National Fire Alarm Code NFPA 72. The intent of these tests is to ensure proper operation of the detector as installed and operated in a fire alarm system. The purpose of this white paper is to identify each required test as defined in the Code to clarify for architects, engineers and fire alarm installers in the fire protection community, as well as authorities having jurisdiction (AHJ's), the different methods to test System Sensor smoke detectors. **This white paper primarily addresses intelligent detectors.** Additional testing methods may exist as specified by individual manufacturers. **All NFPA 72 references in this document are out of the 2002 edition.***

All sensors must be tested after installation and periodically thereafter (see NFPA 72, Section 10 Table 10.4.3 Testing Frequencies). Sensors offer maximum performance when tested and maintained in compliance with NFPA 72 and the manufacturer's instructions; however, it is also necessary to comply with all testing requirements or methods of the AHJ.

Any sensor that fails the testing methods outlined in this document should be cleaned and retested (see your detector installation manual for details). If the sensor fails after cleaning, it must be replaced.

### **Before Testing Detectors**

Notify proper authorities, including any offsite monitoring (central station) as well as any building management, security and occupants, that the system will be undergoing maintenance, the audible/visible appliances may be activated and the system will be temporarily out of service.

NFPA 72, Chapter 10, Inspection and Testing Requirements can be broken down into three related, but separate, tests:

1. Visual Inspection
2. Smoke Entry
3. Sensitivity

Each of these is explored in more detail below.

### **Visual Inspection (Paragraph 10.3 and Table 10.3.1)**

Visual inspection is required upon initial and any reacceptance testing and semiannually thereafter. Visual inspection is intended to identify physical or other problems and conditions that might not be indicated through electrical supervision. This might include, but is not limited to, a range of issues: dust covers being left in place after installation, alterations to building structure or changes to the processes in the protected area.

*Visual inspection identifies physical or other conditions not indicated by electrical supervision.*

**Smoke Entry Testing (Paragraph 10.4.2.2 and Table 10.4.2.2, 13(g))**

“The detectors shall be tested in place to ensure smoke entry into the sensing chamber and an alarm response,” NFPA 72 National Fire Table 10.4.2.2, 13 (g) Smoke Detectors.

The smoke entry test requirement is intended to ensure smoke can physically enter the sensing chamber of the detector. Smoke entry tests may be performed by a number of methods, but care should be taken to ensure they are non-damaging; they should also be 3rd party (e.g.: UL) listed. One method to perform smoke entry testing is to use an aerosol generator that produces a measured amount of smoke during the test.

Another more commonly performed smoke entry test method is that of a pressurized aerosol canister. While these offer significant attractions for inexpensive, simple and quick testing, they are not without drawback or risk. Although not very common, oily residue from misused or inappropriate product, over a period of time, could make the detector more sensitive and prone to nuisance alarms. Chemically incompatible formulae could also lead to stress cracking of plastics, although again, this is not very common. Furthermore, duration of spray, angle of aerosol container, distance between detector and aerosol container and environmental conditions can interact differently with different detectors – particularly in today’s environment of increasingly complex and sophisticated sensors. In all cases, requirements of the manufacturer of the test medium must be followed.

Note: For System Sensor Acclimate smoke detectors, functional testing must be performed before smoke entry testing. Magnet tests, one form of functional testing, initiate an approximate five-minute period when the detector’s signal-processing software routines are inactive. If you do not perform the magnet test before the smoke entry test, a time delay will activate before the detector alarms to accommodate the device’s internal signal processing algorithms. The magnet tests do not, however, replace the need for smoke entry tests. \*See Functional Magnet Test section for performance details.

**Calibrated Sensitivity Testing (Paragraph 10.4.2.2 and Table 10.4.2.2, 13 (g))**

The calibrated sensitivity test is designed to verify that a detector is operating within its listed and approved sensitivity range. Paragraph 10.4.3.2.4 of NFPA 72 lists the various alternative methods for testing sensitivity of a detector. Some intelligent fire alarm system manufacturers have listed their fire alarm control panels (FACP) for this purpose. Other panels may show the original sensitivity setting of the detector at the time of installation. Sensitivity measurements may include analog values, percent-per-foot and percent-of-alarm, though, not all sensitivity test devices will provide measurement. Please note that sensitivity testing can also be performed with a device that is independent of the alarm system and, if the sensitivity test is performed by using a device that introduces smoke or surrogate smoke to the detector, the requirements for functional testing would be met (note that, unlike functional tests, sensitivity tests may not be required or performed every year).

*Smoke entry testing ensures smoke can physically enter the detector’s sensing chamber.*

*Calibrated sensitivity testing verifies the detector is operating within its listed and approved sensitivity range.*

## Testing Frequency

Paragraph 10.4.3 and Table 10.4.3 outline the frequency at which testing is required.

**Sensitivity:** Paragraph 10.4.3.2 and its subparagraphs address the sensitivity frequency test requirements. This permits for extension of the periods between sensitivity tests under certain circumstances.

**Smoke Entry:** Table 10.4.3, section 15(h) requires functional testing (smoke entry) upon initial and any subsequent reacceptance testing, as well as annually thereafter.

## ADDITIONAL OPERATIONAL AND TESTING INFORMATION SPECIFIC TO SYSTEM SENSOR DETECTORS

### Magnet Test

Many System Sensor detectors offer an additional test feature, known as magnet tests. This test uses a magnet to activate the detector, thereby testing the detector's alarm circuit, connections to the control panel and the cause and effect program, such as verifying door closure, notification activation and damper operation.

To perform this test, hold the test magnet in the magnet test area. The sensor will generate an alarm at the panel. Its LEDs, which are controlled by the panel, will indicate the status of the sensor.

Coded signals, transmitted from the panel, can cause the LEDs to blink, latch on or latch off. Refer to your control panel installation guide for sensor LED status operation.

This test does not replace the NFPA 72 requirement for smoke entry tests.

For more information regarding Smoke Detector Testing, please contact:

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